Belsky 2020 Pollinator Oral

ABSTRACT SYMPOSIUM NAME: Extending the Boundaries of Pollinator Research and Risk Assessment Methodologies for Pesticides

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: AGRO

CONTROL ID: 3432662

PRESENTATION TYPE: Oral Only : Do not consider for Sci-Mix

TITLE: Innovative approaches to evaluating the effects of insecticides on non-*Apis* bees

AUTHORS (FIRST NAME, LAST NAME): Joseph Belsky[1]

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INSTITUTIONS (ALL): 1. Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, NC, United States.

ABSTRACT BODY:

Abstract: Declines in some bee populations have been attributed to several environmental stressors including pesticides. Due to differences in life history and pesticide sensitivity, there is an ongoing international effort to develop toxicity testing methods that extend beyond honey bees (*Apis mellifera*) to include non-*Apis* bees. This presentation will discuss innovative research approaches and findings from laboratory studies performed using bumble bees (*Bombus impatiens*) and mason bees (*Osmia lignaria*). To evaluate the effects of chronic oral exposure to the insect growth regulator (IGR) diflubenzuron (0.1, 1, 10, 100 and 1000 µg/liter) on *B. impatiens* worker health and brood development, we used 6-week queenless microcolonies. Syrup and pollen consumption were reduced significantly for all diflubenzuron concentrations tested. Pupal cell production was decreased in the high-dose group. Drone production, a proxy for reproductive success, was inhibited in a concentration-dependent manner. To assess the toxicity of pesticides to *O. lignaria*, we developed and employed a novel modified spray tower design. Male and female *O. lignaria* adults were exposed by whole-body contact to low and middle label recommend rates of commercially blended insecticide mixtures (each with a different mode of action) for orchard crops. Mortality was monitored at 24, 48, 72 and 96-hours post treatment. Products containing neonicotinoid and pyrethroid insecticides induced rapid mortality, while diamide (chlorantraniliprole), molting hormone agonist (methoxyfenozide) and IGR (spinetoram) chemistries induced gradual mortality. High mortality was recorded for all insecticide treatments (LD_{50}<1 µg/bee) at 96-hours after application to adult mason bees. These studies provide insights into the effects of pesticides on under-studied species of non-*Apis* bees and provide a platform for continued methods development. Standardized methods are needed to support risk assessment activities and ultimately pollinator protection goals. *This abstract does not represent U.S. EPA policy.*

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SESSION SYMPOSIUM NAME:

SESSION SYMPOSIUM PROGRAM AREA NAME:

Johanne Brunet 2020 Pollinator Oral

ABSTRACT SYMPOSIUM NAME: Extending the Boundaries of Pollinator Research and Risk Assessment Methodologies for Pesticides

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: AGRO

CONTROL ID: 3431950

PRESENTATION TYPE: Oral Only : Consider for Sci-Mix

TITLE: Using bee foraging behavior to asses risk from pesticide exposure

AUTHORS (FIRST NAME, LAST NAME): Johanne Brunet[1]

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ABSTRACT BODY:

Abstract: Pesticides have been shown to impair bee foraging and negatively affect bee health. These studies have been done mostly with honey bees and some with bumble bees, both social bees with colonies. But the great majority of bee species are solitary. We have approximately 40 native bumble bee species in the United States and 4,000 native solitary bee species. The honey bee is a non-native social bee. Pesticides affect all bees and all bee species forage for pollen and nectar and exhibit specific behaviors when foraging. Here, we explore the different behaviors exhibited by different bee species while foraging. We contrast the foraging behavior of the European honey bee, *Apis mellifera*, the common eastern bumble bee, *Bombus impatiens*, and the alfalfa leafcutting bee, *Megachile rotundata*. We compare behavior at different scales. For honey bee and bumble bee, we contrast behaviors captured using Radio Frequency Identification (RFID) although such devices have not yet been adapted for use with solitary bees. We also compare all three species foraging within fields, using direct pollinator observations. While our research has focused on linking foraging behavior to gene flow risk for different bee species, we propose exploring the use of foraging behavior to assess risk from pesticide exposure. There has been a call for new techniques and protocols across the globe for making standard assessments on non-*Apis* bees. Bee species share foraging behaviors and such behaviors could be linked to pesticide exposure and ultimately to bee health. Foraging behavior could not only quantify the impact of a pesticide on the foraging of a bee species but also contrast the relative impact on different bee species. Foraging behavior as a potential assay for pesticide exposure would be applicable to all bees and could be standardized across bee species.

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SESSION SYMPOSIUM NAME:

SESSION SYMPOSIUM PROGRAM AREA NAME:

Collins 2020 pollinator oral

ABSTRACT SYMPOSIUM NAME: Extending the Boundaries of Pollinator Research and Risk Assessment Methodologies for Pesticides

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: AGRO

CONTROL ID: 3433611

PRESENTATION TYPE: Oral Preferred : Do not consider for Sci-Mix

TITLE: Consideration of Non-*Apis* Bee Species in Pollinator Risk Assessment

AUTHORS (FIRST NAME, LAST NAME): Jennifer Collins[1], Jennifer Jackson[1], Amelie Schmolke[1], Amy M. Ritter[2]

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INSTITUTIONS (ALL): 1. Waterborne Environmental, Inc., Leesburg, VA, United States.
2. Waterborne Environmental Inc, Leesburg, VA, United States.

ABSTRACT BODY:

Abstract: The pollinator risk assessment process for pesticides from regulatory agencies, including USEPA, PMRA, and CDPR, have historically relied on the Western honeybee (*Apis mellifera*) as a surrogate species to represent all *Apis* and non-*Apis* bees. However, the life-history characteristics of non-*Apis* bee species, including solitary, stingless, and bumble bees, indicate differences from the surrogate honeybee species. These differences introduce uncertainty in the exposure and effects assumptions for the use of honeybees as a surrogate species, leading to the recent efforts of examining risk of pesticides to non-*Apis* species. The objective of this presentation is to provide a current state-of-the-science update on the specific life-history characteristics and specific risk assessment considerations for non-*Apis* species. Exposure assumptions will be examined and comparative toxicological sensitivities will be presented with recommendations for appropriate use in the pollinator risk assessment framework. Challenges in the development of non-*Apis* laboratory testing methods will also be presented.

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SESSION SYMPOSIUM NAME:

SESSION SYMPOSIUM PROGRAM AREA NAME:

Maura Hall 2020 pollinator oral

ABSTRACT SYMPOSIUM NAME: Extending the Boundaries of Pollinator Research and Risk Assessment Methodologies for Pesticides

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: AGRO

CONTROL ID: 3430286

PRESENTATION TYPE: Oral Preferred : Consider for Sci-Mix

TITLE: Quantifying neonicotinoid insecticide residues in pollinator-attractive habitat adjacent to corn and soybean fields in Iowa

AUTHORS (FIRST NAME, LAST NAME): Maura J. Hall[1], Ge Zhang[1], Matthew O'Neal[1], Steven Bradbury[1, 2], Joel R. Coats[1]

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ABSTRACT BODY:

Abstract: Neonicotinoid insecticide residues can be transported from corn and soybean fields to adjacent pollinator habitat through dust-drift from planting treated seeds and/or through surface/sub-surface runoff following precipitation events. Bees could subsequently be exposed to neonicotinoids through consumption of contaminated pollen and nectar. Previous studies indicate neonicotinoids can be detected in pollinator-attractive habitats; however, the magnitude and extent of potential adverse effects to honey bees and native bees is an active area of investigation. In this study, the concentrations of clothianidin, imidacloprid, and thiamethoxam in pollen and nectar samples were quantified. Nectar and pollen samples were collected from six habitat patches immediately downslope of corn and soybean fields planted with neonicotinoid-treated seeds from May through August in 2018 and 2019 (~6 samples per site). Samples were extracted and analyzed by liquid chromatography-tandem mass spectrometry (LC-MS/MS). Results from 2018 indicate 80% of pollen samples and 10% of nectar samples had at least one neonicotinoid present above the method detection limit (MDLs ranged from 0.04 to 1.0 ng/g pollen and 0.05 to 0.3 ng/g nectar). For samples $\geq$ the MDL, neonicotinoid concentrations ranged from 0.14 to 5.12 ng/g pollen. These data are refining pollinator risk assessments by providing information on spatio-temporal variability of neonicotinoid exposures in Midwestern agroecosystems.

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SESSION SYMPOSIUM NAME:

SESSION SYMPOSIUM PROGRAM AREA NAME:

Anson Main 2020 pollinator oral

ABSTRACT SYMPOSIUM NAME: Extending the Boundaries of Pollinator Research and Risk Assessment Methodologies for Pesticides

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: AGRO

CONTROL ID: 3433951

PRESENTATION TYPE: Oral Preferred : Do not consider for Sci-Mix

TITLE: A multi-year field experiment testing effects of imidacloprid-seed treatment use on wild bee functional guilds of Midwestern agroecosystems

AUTHORS (FIRST NAME, LAST NAME): Anson Main[3, 1], Elisabeth Webb[2, 3], Keith Goyne[3, 5], Robert Abney[3], Doreen Mengel[4]

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2. U.S. Geological Survey, Columbia, MO, United States.
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5. Virginia Tech, Blacksburg, VA, United States.

ABSTRACT BODY:

Abstract: Unlike honeybees, numerous wild bee species nest belowground in/near cultivated fields and surrounding flowering field margins. Although agricultural field margins can serve as important bee foraging habitat, these areas may also accumulate neonicotinoid insecticides via runoff events and planter dust from surrounding agricultural fields. Few field studies have evaluated neonicotinoid impacts on wild bee functional guilds including nest preference (e.g., ground, cavity, carpenter) or diet specialization (e.g., floral generalists, specialists). To assess effects of neonicotinoid exposure on wild bee guilds, we sampled 30 soybean fields on five Conservation Areas in Missouri from pre-seeding through harvest in 2017 and 2018. Soybean fields were cultivated using one of three treatments: imidacloprid-treated fields (n=10); untreated fields (n=10); and previously treated (2016) to untreated fields (n=10). At each site, we collected field and field margin soils, flowers from margin plants, and soybean crop flowers. Wild bees were sampled monthly during five sampling periods (pre-seeding, post-seeding, growing, soybean flowering, and harvest). Across all sites, 11,351 bees were collected that represented 147 distinct species. Neonicotinoid residues were detected in field soils during all sampling periods of both years (overall: 2017, 28%; 2018, 47%). However, neonicotinoids were infrequently detected in margin soils (<8% frequency), field margin flowers (<1%) and no residues were detected in soybean flowers. Ground-nesting bee abundance and richness and floral specialist abundance were significantly less in previously-treated fields compared to untreated fields. Over both years, ground-nesting bee abundance was significantly lower in fields with greater soil neonicotinoid concentrations measured the previous year, regardless of treatment. Similarly, there were fewer floral generalists and less ground-nesting bee species collected near soybean fields with greater soil neonicotinoid concentrations. Here, we present our multi-year findings and discuss how this research improves our understanding of neonicotinoid seed-treatment use on non-target wild bee communities within agroecosystems.

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SESSION SYMPOSIUM NAME:

SESSION SYMPOSIUM PROGRAM AREA NAME:

Developing new methods to evaluate toxicity for different bee species in Brazil - facing the challenges

Roberta C. F. Nocelli
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Brazil has the greatest diversity of bees in the world; however, several species are now listed as endangered or decreasing in abundance. Some of the agricultural pesticides currently used in Brazil may be harmful to bees. To ensure the protection of biodiversity within the context of sustainable agriculture, it is important for Brazil to have a system to evaluate whether compounds are safe for bees and effective in agriculture. Standard protocols for bee toxicity tests use species that are not native to Brazil, *e.g.* the honey bee, *Apis mellifera*. The distribution of native bee species in Brazil varies widely. Commercial sources of bees native to Brazil are not available, and few professionals are specialized in working with them. We have developed a proposed standard protocol using stingless bees from adaptations to OECD (1998a, b) protocol for *A. mellifera* using three different stingless bee species: *Melipona scutellaris; Scaptotrigona postica;* and, *Tetragonisca angustula*. The bee collection method, the experimental cage and anesthesia times were optimized. The proposed protocol was tested between October 2018 and August 2019 using dimethoate, a commonly used reference toxicant in bee toxicity studies. Currently, 14 laboratories in Brazil are involved in the standardization of the protocol, with more than 25 people trained to carry out the procedure. Partnerships with other countries with stingless bees are being established to apply this protocol there. The results will provide evidence to accept or reject *A. mellifera* as a surrogate for Brazilian native bees in toxicity studies of pesticides. In addition, we have already developed a protocol for testing larvae of meliponines and are working on the development of tests for native solitary bee species.

Eric Peterson 2020 pollinator Oral

ABSTRACT SYMPOSIUM NAME: Extending the Boundaries of Pollinator Research and Risk Assessment Methodologies for Pesticides

ABSTRACT SYMPOSIUM PROGRAM AREA NAME: AGRO

CONTROL ID: 3396620

PRESENTATION TYPE: Oral Preferred : Consider for Sci-Mix

TITLE: Characterization of agrochemical exposure to native pollinators near cattle feed yards and row crop agriculture via natural nest bundles

AUTHORS (FIRST NAME, LAST NAME): Eric Peterson[1], Caleb Tomlinson[2], Scott Longing[2], Phil Smith[1]

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2. Plant and Soil Science, Texas Tech University, Lubbock, TX, United States.

ABSTRACT BODY:

Abstract: Insect pollinators are declining worldwide due to a variety of factors such as habitat loss, disease, non-native species, and pesticides. However, characterizations of agrochemicals present in the environment that may be harmful to pollinators are limited. Beef cattle feed yards and row crop agriculture are the foremost agrochemical end-users in the Southern High Plains of the United States. In an effort to characterize agrochemical availability in this region and the potential risk to pollinators, phragmites reed nest bundles were deployed alongside beef cattle feed yard boundaries and row crops. Nest bundles were established prior to pollinator emergence in February and collected in November over the course of two field seasons. Reeds were opened to determine cavity-nesting insect species occupancy and reed cell matrices (mud, feces, leaves, pollen, and larvae) were analyzed via liquid chromatography-mass spectrometer for agrochemicals commonly used in this ecoregion. Screening of reed matrices revealed the presence of a variety of agrochemicals including thiamethoxam, imidacloprid, clothianidin, dicrotophos, diazinon, malathion, ivermectin, permethrin, and bifenthrin. Over 50% of mud, feces, and larvae contained agrochemical concentrations above limits of quantitation. Further, species composition between reeds at feed yard locations and reference sites differed dramatically. Reeds placed adjacent to feed yards were colonized by mostly non-pollinating wasps (94%), while reference location emergence was dominated by native leafcutter bees (69%). Native bee monitoring strategies like those used in this study may allow for more accurate determination of agrochemical distributions in the environment and enhance assessments of risk to native pollinators.

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